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1227837

DRAWINGS ATTACHED

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(54) A PRESS

(71) We, E. W. BLISS COMPANY, a company incorporated in the State of Delaware, United States of America, of 217 Second Street, N. W. Canton, Ohio, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a press.

In accordance with the invention there is provided a press comprising a die; a ram aligned with said die and reciprocable between a first position spaced from said die and a second position wherein it cooperates with said die to form a workpiece positioned therebetween; feed means supplying workpieces between said ram and said die when said ram is in first position, said feed means including: a first endless flexible belt member providing spaced workpiece receiving openings, means for positioning workpieces in said openings, and guide means for guiding said belt member between said ram and said die and aligning one of said openings with a workpiece therein with said ram and maintaining said one opening aligned therewith at least until said ram engages said workpiece.

In accordance with the invention there is also provided a press comprising a die; a ram aligned with said die and reciprocable between a first position spaced from said die and a second position wherein it cooperates with said die to form a workpiece positioned therebetween; feed means for feeding workpieces between said ram and said die when said ram is in said first position; and, discharge means for removing a formed workpiece after said ram has disengaged said workpiece, said discharge means including an endless flexible belt providing spaced workpiece receiving openings and guide means for guiding said belt adjacent said die and positioning one of said openings in alignment with said ram at least during the period said ram is in said second position.

By the provision of the endless flexible belt feed and discharge means several forming presses can be interconnected in a single, continuous processing line and the workpieces continuously formed with no batch processing, manual handling, etc. When the presses are of the rotary turret type the flexible belt arrangement is especially advantageous since feed and discharge takes place in one smooth motion and extremely high production rates are possible.

In order that the present invention may be well understood, there will now be described an embodiment thereof, given by way of example only, reference being had to the accompanying drawings wherein:

Figure 1 is a plan view, somewhat diagrammatic, of a portion of a cartridge casing processing line utilizing a press according to the present invention;

Figure 2 is a pictorial view of the workpiece supplying portion of the processing line of Figure 1;

Figure 3 is a sectional elevational view taken on line 3—3 of Figure 1;

Figure 4 is a cross-sectional view taken on line 4—4 of Figure 3;

Figure 5 is a view, partially in section, taken on line 5—5 of Figure 1;

Figure 5A is a detail plan view of one of the dies shown in Figure 5;

Figures 6 and 6A are elevational views, partially in section, taken on line 6—6 of Figure 1; and

Figure 7 is an enlarged sectional view through one of the ram assemblies shown in Figure 6.

Figure 1 shows, somewhat diagrammatically, a cartridge casing processing line; the layout of the processing line, or the specific forming or treating steps performed therein,

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form no part of the subject invention but are illustrated merely for the purpose of aiding in a proper appreciation and understanding of the invention.

The Processing Line in General

Although the specific construction of various components of the processing line will subquently be described in detail, broadly, as shown, the line includes a blank feed apparatus A which feeds relatively short, heavy walled cup-shaped blanks to a rotary inserting apparatus B which inserts the blanks into resilient openings carried on an endless flexible belt. The belt is trained about a first guide member carried on the inserting apparatus B and a second guide member mounted on a rotary turret type forming press C. As the blanks are conveyed about the turret press C they are acted upon by rams carried by the press and, moved through a drawing or extruding ring to elongate and thin their side walls. Simultaneously, the blanks are removed from the openings in the first belt and received in similarly arranged openings carried on a second subjacent belt. The second belt functions to discharge the partially formed blanks from press C and convey them to a second generally similarly arranged rotary turret type forming press D which redraws or performs other forming operations on the blanks.

Simultaneous with the forming operations, press D transfers the blanks from the second belt to a third belt which conveys the blanks to a third rotary turret type forming machine E. Machine E is arranged to "head" and taper the blanks in a manner required for cartridge casings. While passing through the forming machine E the blanks are separated from the belt and, subsequently, reinserted in the belt openings and discharged from the machine. Thereafter, the belt is guided through a conventional induction type annealing apparatus F which, during passage of the belt therethrough, anneals the casings. Subsequently, the belt passes through an apparatus G which discharges the casings from the belt where they can be collected for subsequent machining or other processing.

Blank Feed Apparatus A

As best shown in FIGURE 2, the blank feed apparatus A comprises a conventional vibratory batch feeder 10 which discharges the short, heavy welled, cup-shaped blanks 12 to a conventional vibratory bowl feeder 14. Bowl feeder 14 includes a spiral trackway 16 which is given relatively high frequency, low amplitude vibrations to cause the blanks 12 to travel up and around the spiral. During their travel along trackway 16 the blanks are assured of having proper orientation by an orienting means 18. Means 18 are conventional and assure that blanks 12 leave the trackway 16 with their open ends 20 facing upwardly. The blanks continue along track 16 and are discharged from the vibratory bowl feeder 14 along a guide track 22. The apparatus thus far described is a conventional, commercially available type feed apparatus and, accordingly, further description appears unnecessary.

Inserting Apparatus B

As the blanks discharge from guide track 22 they pass into an inserting apparatus B. As shown, inserting apparatus B includes a vibratory pan 24 which receives the blanks 12 coming from guideway 22. A vertically extending wall, or keeper rail 26 extends about pan 24 to maintain the blanks thereon. Positioned adjacent pan 24 and mounted for rotation on a non-rotating, vertically extending support shaft 28 is a rotary feed table member 30. The feed table 30 is continuously driven in a clockwise direction by drive apparatus not shown. As can be seen, the outer periphery of the feed table 30 is provided with circumferentially spaced inwardly extending blank receiving recesses 32. Accordingly, as the table 30 is rotated the blanks 12 in the vibratory pan 24 are received in the recesses 32 and rotated clockwise in the manner shown.

Positioned above the feed table 30 and axially aligned with each of the respective blank receiving openings 32 are a plurality of punch or ram members 34 carried on slides 36. Although only three punch members are shown, it should be appreciated that one such punch is provided for each of the recesses 32. The slide members 36 which support the punches 34 are mounted in a turret member, not shown, which is driven simultaneously with the feed table 30. The turret member restrains the punches again radial movement but permits them to have a guided vertical movement relative to the recesses 32.

The means for selectively driving the slides to cause the rams to be reciprocated vertically comprise a stationary drum-type cam member 38 which is fixedly supported from shaft 28 by legs 40. Consequently, as the table 30 and the turret are rotated, the rams 34 are reciprocated vertically throughout a path determined by the layout of cam member 38.

Referring specifically to FIGURES 3 and 4, it is seen that positioned immediately below rotary table 34 and connected thereto for simultaneously rotating therewith is a belt guide member 42. Member 42 is arranged to simultaneously drive and guide a belt member 44 about its outer periphery.

Although belt member 44 could be of a variety of specific configurations and constructions, it is shown as including an elongated, continuous, relatively flexible band of stainless steel 46. Carried on band 46, and extending laterally therefrom, are a plurality

of spaced, resilient, plastics clip members 48 formed, for example, from an acrylonitrile-butadiene-styrene resin. As shown, each member 48 has a vertically extending opening 49 formed therein. Openings 49 are sized so as to be capable of closely gripping and holding the circumferential surface of blanks 12. The clip members 48 are fixedly connected to the band 46 in any convenient manner, such as through the use of rivets or adhesive bonding.

Referring again to FIGURE 4 and the belt guide member 42, it is seen that the outer periphery of the member 42 is provided with inwardly extending recesses or openings 52 which are arranged to receive the clip members 48. Accordingly, the belt 44 is driven in the manner of a chain by engagement of the clip members in the recesses 52. Additionally, the belt is further guided and driven by small pins 54 which extend radially outward from the outer surface of member 42 and engage small openings 56 formed transversely of band 46 (see FIGURE 3).

As will be appreciated, member 42 is provided with a number of recesses 52 equal to, and identically spaced with, the recesses 32 of rotary table member 30. Additionally, recesses 52 are arranged so that when the clip members 48 are in the recesses, the opening 49 of the respective clip member is aligned with the blank 12 carried in the corresponding recess 32 of the table 30.

The importance of this relationship can be best seen by reference to FIGURE 3. As shown, when any particular recess 32 is at the position labeled 1B, the punch 34 is spaced above table 32 and the blank 12 is supported on a portion of table 24 which extends inwardly between member 30 and member 42 to the position noted by reference letter a. As the table and rams are rotated in a clockwise direction (to the left as shown in FIGURE 3) the layout of cam 38 is arranged to cause the rams 34 to move downwardly as shown in positions 2B and 3B. When the ram has reached position 3B it enters the open upper end 20 of the blank 12 and, upon further movement downwardly, forces the blank into the opening 49 in the subjacent resilient clip 48. As the table and ram move from position 4B to position 5B, the ram is withdrawn from the blank and the blank is then firmly gripped in the belt and can be conveyed away in the manner shown in FIGURE 2.

It is important to note that should any of the blanks be improperly oriented, i.e. have their open end 20 facing down, they will be forced completely through the belt during the downward movement of the ram. As will hereafter become apparent, this prevents blanks from being misfired to the press C.

Rotary Press C

Referring again to FIGURE 1, it is seen that as the belt 44 leaves the inserting apparatus B it is trained about a guide disc or member 60 rotatably carried by the main press C. Member 60 is constructed in stationary support shaft 61 of the rotary the same manner as previously described for member 42 of the inserting apparatus B, that is, it is provided with inwardly extending recesses 62 which receive the clip members 48 of the belt 44.

Referring specifically to FIGURE 5, the details of the belt guide members and the tooling of the press will be described in detail. As shown, positioned immediately below the belt guide member 60 and arranged for simultaneous rotation therewith is a second disc-like member 64 which carries a plurality of die units 66 at spaced points circumferentially thereof. In the embodiment under consideration, die units 66 each include an extruding ring member 68 which is releasably carried in the disc member 64. As shown in FIGURE 5A, each extruding ring 68 has a transversely extending extruding opening 69 which has a diameter corresponding to the desired outer diameter of the product of the drawing operation performed in press C. The outer circumference of the die 68 is provided with an inwardly extending recess or groove 70 which mates with an outwardly extending key 72 formed on the wall of a recess 74 which extends inwardly from the outer periphery of member 64. The die 68 is releasably retained in the recess and in engagement with the key 72 by retainer plates 76 which are releasably connected to the member 64 or the key 72 in any convenient manner, such as through the use of screws 78.

As can be seen in Figure 5, one of the die units 66 is mounted beneath each of the recesses 62 of member 60. Additionally, the dies are located so that when the belt 44 with the blanks 12 therein is in position on member 60, the blanks 12 are axially aligned with the openings 69 of the respective die 68.

Both members 60 and 64 are mounted for simultaneous rotation on the vertically extending support shaft 61. Also, carried by support shaft 61 and mounted for simultaneous rotation with members 60 and 64, are a number of rams 82 equal to the number of die units 66. The rams 82 are reciprocated vertically in a predetermined path by slides 84 driven from a stationary cylindrical drum type cam 86. The slides are provided with the usual cam follower rollers 87 and are guided in their vertical movement by a rotary turret member not shown.

Referring to FIGURES 1 and 5, it is seen that as the blanks carried in belt 44 reach the approximate position indicated by the line 1C, the respective punch 82 is spaced

above the blank. The cam 86 is arranged so that with continued rotation it drives the punch 82 downwardly, as shown in position 2C into engagement with the blank 12. Continued rotation of the press causes the ram to force the blank from the belt and through the extruding opening 69 of the die 68. As shown in positions 3C and 4C, the blank is forced through the die and the side walls thinner and elongated. Between positions 4C and 5C, the extruded or drawn blank (hereafter identified as 12a) has passed completely through the die 68. Thereafter, the cam 86 actuates the ram 82 upwardly stripping the part 12a therefrom.

It is apparent that with the part 12a stripped from the ram it could simply be allowed to drop into a subjacent hopper or conveyor unit and conveyed in a conventional manner to a subsequent machine, or, alternatively batch processed; however, in accordance with an aspect of the subject invention, the finished part is received in an endless flexible belt unit 90 which is formed, for example, generally in the manner described for belt unit 44. That is, the belt unit 90 includes an endless flexible band of stainless steel 92 provided with a plurality of laterally extending, resilient clip members 94. The clip members 94 are, as shown in FIGURE 1, provided with openings which have a normal size slightly smaller than the outer diameter of the part 12a which has just been formed by press C.

Means are provided to guide belt 90 adjacent the die unit 66 with the openings in clip members 94 aligned with the respective dies 68 at least during the period of time when the rams 82 are forcing the parts through the die and out its lower end, e.g. position 4C. This provides a receiving and discharging arrangement for the drawn parts 12a. Although these guide means could be positioned externally of the press C and merely operated in timed relationship therewith, they preferably comprise a disc-like member 98 mounted beneath the die carrying disc member 64 and rotatable therewith. Member 98 is formed substantially identically with member 42 and includes recesses which are spaced circumferentially and receive the clips 94 and maintain their openings 91 aligned with the openings 69 of die units 66. Additionally, the belt 90 is supported and guided by pins 93 which extend outwardly from the peripheral surface of member 98 and through openings 95 formed in band 92. In this manner, the means which drive the rotary press C simultaneously drive both the feed and discharge mechanisms in perfect timed relationship. Consequently, as part 12a is passed out of the die 68 and stripped from the ram 82 it is immediately gripped and held by the subjacent clip 94.

As can be seen, the use of the endless belt arrangement for feeding the turret press eliminates any type of separately driven reciprocated feed mechanism and the repeated separate handling of the various parts. Additionally, this same type of belt mechanism greatly simplifies the discharge apparatus required for the rotary press. It is important to note that throughout the feeding, working, and discharging steps in the operation of the turret press the parts is always firmly gripped by either the belt members or the rams and dies. This allows the mechanism to function at an extremely high rate when compared with prior feed and discharge mechanisms. Additionally, this arrangement eliminates the need for batch processing between various forming steps in the manufacture of items such as cartridge casings.

Rotary Press D

Referring again to FIGURE 1, it is seen that belt 90 is also trained about a second rotary-type forming or drawing press D. Although press D could perform additional operations on the parts coming from machine C, in the embodiment shown, it is utilized to perform an additional drawing, i.e. a redrawing, operation on the blanks. Preferably, press D would be constructed substantially identically with press C other than for modification of the size of the dies.

The belt 90 is shown as passing between presses C and D and being guided about a horizontally positioned guide member or roller 100. Roller 100 is provided with outwardly extending pins 102 which engage the openings 95 formed in band 92. This roller 100 is utilized for maintaining the band under proper tension and, additionally, for adjusting the extent of wrap of the belt 90 on the presses C and D.

Because press D is constructed basically the same as press C further description appears unnecessary. For present purposes it is enough to note that a second belt member 104 formed in the manner of belt members 44 and 90, is trained about press D at a position to receive the parts 12B, i.e. drawn parts 12a. Consequently, belt 104 functions as the discharge belt for press D.

Forming Machine E

An intermediate guide roller 106 is positioned to the left of the press D and assists in guiding the belt 104 about a third press or forming machine E. As shown in FIGURE 1, the belt 104, after passing guide roller 106, is guided against the outer circumference 108 of a circular disc member 110 of forming machine E. The belt 104 is maintained in engagement therewith throughout an arcuate extent of approximately 75° and then is led away and about a pair of guide rollers 112 and 114. Rollers 112 and 114 are each provided with inwardly extending re-

cesses 116 and 118 respectively, which engage the clip members on belt 104 and assist in guiding it. After the belt leaves roller 114 it is again brought into engagement with the outer periphery of member 108.

The construction of the forming machine E and the operations taking place therein, can be best understood by reference to FIGURES 6, 6A and 7. As shown in FIGURES 6 and 6A the forming machine E includes a vertically extending support shaft 120 which carries the rotatably mounted disc 110. Continuous, fixed position, drum cam members 122 and 124 are supported by shaft 120 above and below disc 110 respectively. Carried by turret members, not shown, and driven by the cams 122 and 124 respectively, are a plurality of upper slides 126 and lower slides 128. The upper slides 126 each carry a tooling assembly which includes a ram or punch 130 and a tapering mandrel 144. The slides 128 carry a heading die or punch 134 which functions to give the partially formed casing the required head or firing pin end configuration.

The operation of machine E can best be explained by reference to FIGURES 1, 6 and 6A. As shown, the belt 104 coming from press D is received on member 110 and the clips 105 received in the recesses 111. The belt 104 is supported and guided on the outer periphery 108 of member 110 by the combined action of guide rollers 106 and 112 and the outwardly extending pins 113 which engage holes 107 in belt 104 (see FIGURES 6 and 6A). As the clips reach position 1E, the slide 126, under the influence of cam 122, has begun actuating the ram 130 down into the workpiece 12b. During rotation from position 1E to position 2E, the ram 130 continues to enter the casing blank and the respective slide 128 has actuated the heading punch 134 up until the small firing pin opening forming protrusion 135 engages the lower closed end of the blank. At position 2E, the casing is then firmly gripped between the ram 130 and the heading die or punch 134. Because of the position of guide roller 112, the continued rotation of member 110 causes the workpiece to be transversely withdrawn from its position in the resilient clip 105. This withdrawal takes place much in the manner of gear teeth separating.

Referring to FIGURE 7, it is seen that the punch or ram 130 is at this time under a downward bias by a spring 138 acting against a piston portion 139 formed on the upper end of ram 130 and guided in a cylinder 139a formed in the slide. As the slide 126 moves from position 2E to position 3E, the punch or ram 130 is moved upwardly in the slide 126 until the shoulders 140 and 142 engage and further upward movement of the ram is prevented. During the final movement of the slide to position 3E, the slide drives the mandrel 144 downwardly about the workpiece 12B. Mandrel 144 is provided with an inwardly extending tapered opening 146 which is arranged to produce the desired slight longitudinal taper to the casing.

Between positions 3E and 4E (FIGURE 6A) the heading punch is actuated upwardly a short distance by cam 124. This causes the lower closed end of the workpiece to be headed or formed as shown. At this time the actual forming steps performed in forming machine E are completed and during rotation to position 5E the slide 126 is actuated upwardly and mandrel 144 is withdrawn. Because of the force of spring 138 the punch 130 acts downwardly to strip the tapered workpiece from mandrel 144. At position 5E the formed workpiece is firmly held between the punch 130 and the heading die 134. At this time, as can be seen in FIGURE 1, the belt is returned to engagement with the member 110. Accordingly, one of the clips 105 again grips the workpiece by slipping thereover from the side.

As the piece moves from position 5E to position 6E the cams 122 and 124 actuate the punch 130 and the heading die 134 away from the workpiece which is then guided away from the machine along the belt path indicated in FIGURE 1.

The belt could, of course, directly convey the headed and tapered workpiece to a discharge machine or, alternatively, convey it to an additional forming machine. In the particular layout shown in FIGURE 1, the belt 104 is guided between a pair of guide rollers 150 and 152 which are formed generally similar to guide rollers 106 and 112, respectively. After passing around guide roller 52, the belt 104 with the workpieces carried therein, is passed through a conventional induction heating apparatus 156 and 157 which anneals the partially formed cartridge casings. The construction of such induction heating apparatus is well-known and forms no part of the present invention.

After passing through the induction heating apparatus the belt passes about the outer periphery of a discharge apparatus G. Although not shown, discharge apparatus G is constructed in basically the same manner as the inserting apparatus B. The only difference being that the punches or rams of apparatus G are actuated downwardly to an extent sufficient to force the formed parts completely from the belt. Thereafter, the belt 104 is trained about a guide roller and back around forming press D where it again receives the parts being formed in press D.

Although the subject invention has been described with reference to a specific cartridge casing processing line, it is apparent that the same belt type feed and discharge arrangements could be utilized for forming a variety of different parts, such as, can bodies,

pencil casings, etc. Additionally, many other types of operations could be performed on the parts while they are in the belts. For example, various gauging, pickling, and washing steps could be carried out with the parts retained in the belt. Further, although the belts have been described as having a preferred construction and configuration it is obvious that other type of belts could be utilized. Further, although the part receiving openings of the belt are shown and described as clips, it is apparent that in many operations, for example in the feed from the inserting apparatus to press C, the part receiving openings could be a simple hole extending transversely through the belt, or a portion thereof.

WHAT WE CLAIM IS:—

1. A press comprising a die, a ram aligned with said die and reciprocable between a first position spaced from said die and a second position wherein it cooperates with said die to form a workpiece positioned there between, feed means supplying workpieces between said ram and said die when said ram is in the first position, said feed means including, a first endless flexible belt member providing spaced workpiece receiving openings, means for positioning workpieces in said openings, and guide means for guding said belt member between said ram and said die and aligning one of said openings with a workpiece therein with said ram and maintaining said one opening aligned therewith at least until said ram engages said workpiece.

2. A press according to claim 1 wherein said die comprises an extruding ring and said ram, when reciprocated from said first to said second position, forces a workpiece therethrough.

3. A press according to claim 2 including workpiece receiving and discharging means for receiving workpieces formed through said extruding ring, said workpiece receiving and discharging means including a second endless flexible belt providing spaced workpiece receiving openings, and guide means to guide said belt adjacent said die to bring one of said openings into workpiece receiving position at least during the time said ram is in said second position and, thereafter to guide said workpiece away from said die.

4. A press according to any of the preceding claims including a plurality of rams each mounted for reciprocation between first and second positions along an individual path and a die member associated with each of said rams.

5. A press according to any of the preceding claims wherein the walls of said openings are resilient and sized so as to resiliently grip said workpieces.

6. A press according to claim 5 wherein said openings are defined by resilient clip members extending laterally from said belt member.

7. A press according to claim 2 including a second endless flexible belt having spaced workpiece received openings and guide means for guiding said second belt adjacent said dies for receiving, in said openings, the finished workpieces.

8. A press comprising a die, a ram aligned with said die and reciprocable between a first position spaced from said die and a second position wherein it cooperates with said die to form a workpiece positioned therebetween, feed means for feeding workpieces between said ram and said die when said ram is in said first position and discharge means for removing a formed workpiece after said ram has disengaged said workpiece, said discharge means including an endless flexible belt providing spaced workpiece receiving openings and guide means for guiding said belt adjacent said die and positioning one of said openings in alignment with said ram at least during the period said ram is in said second position.

9. A press substantially as herein described with reference to, and as illustrated in, the accompanying drawings.

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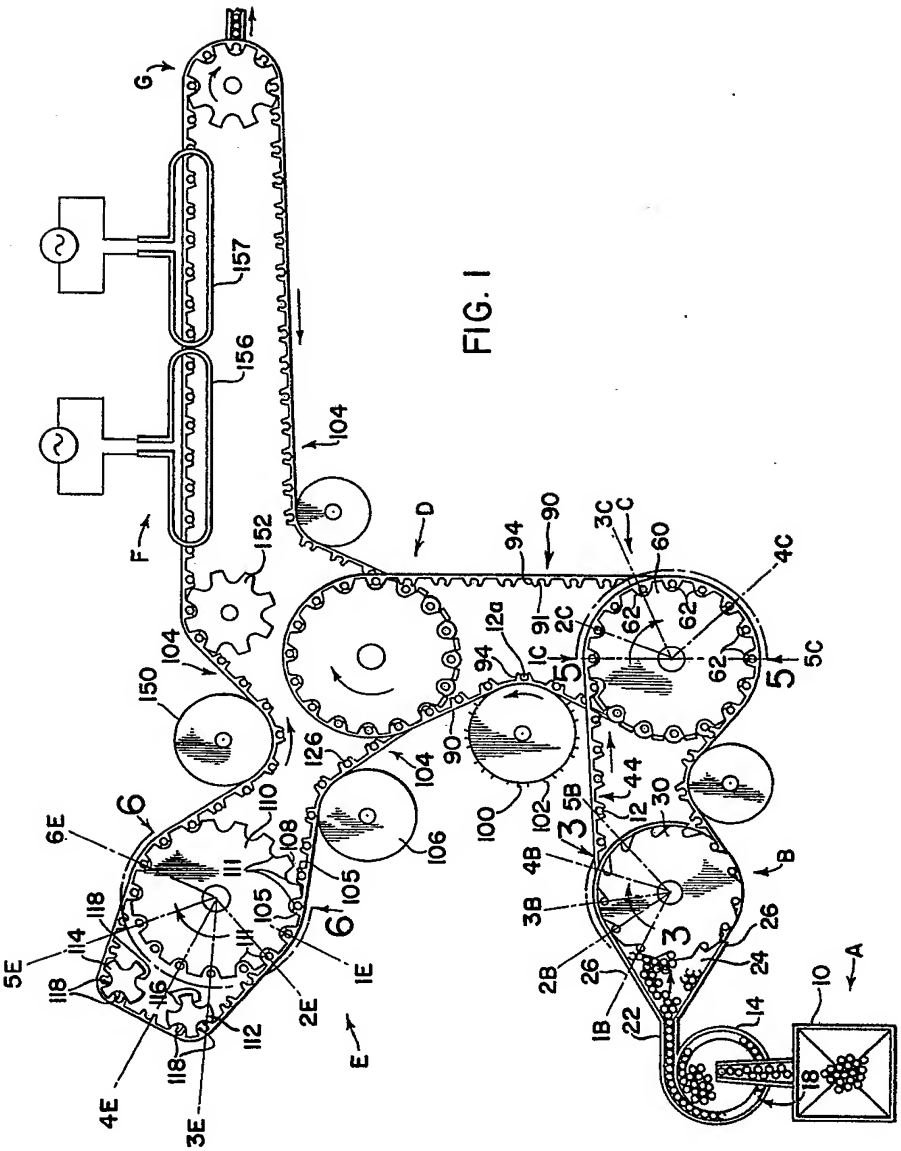
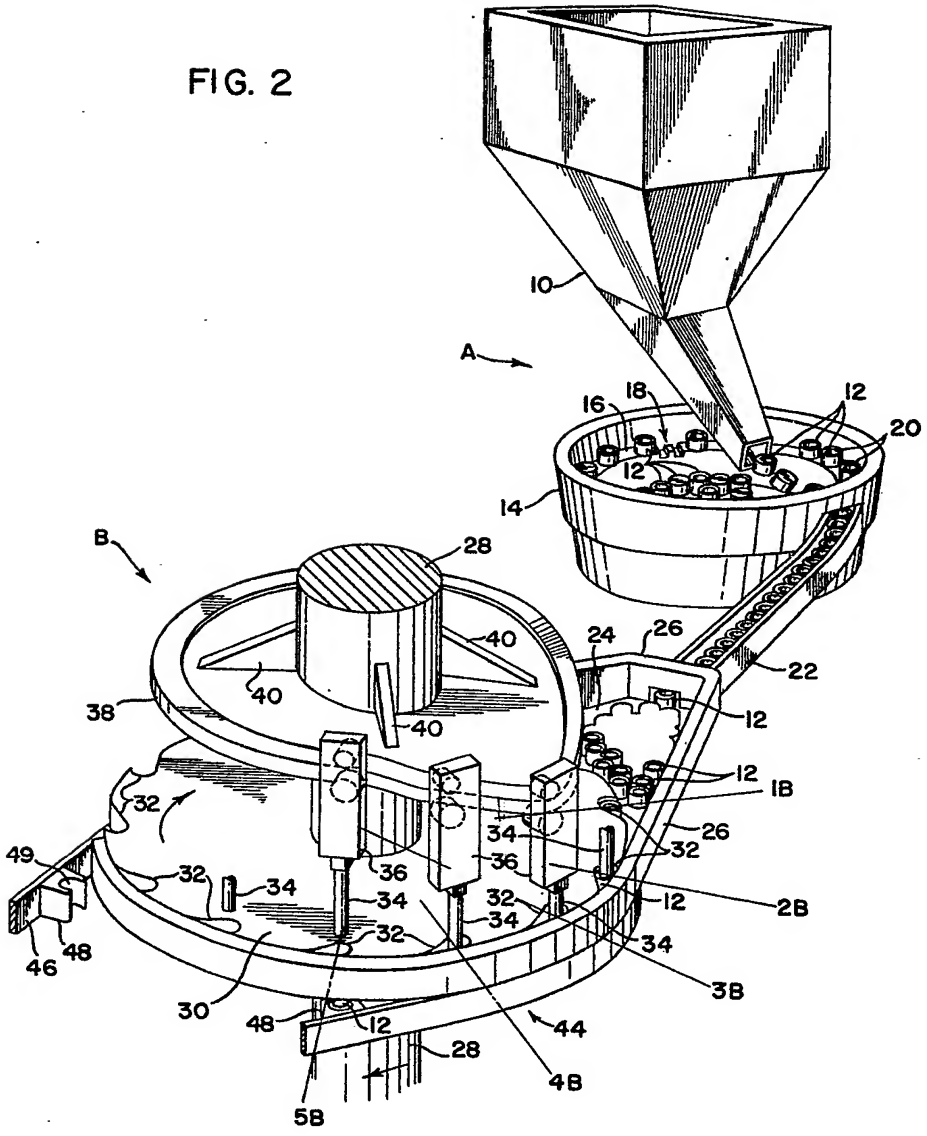


FIG. 1

FIG. 2



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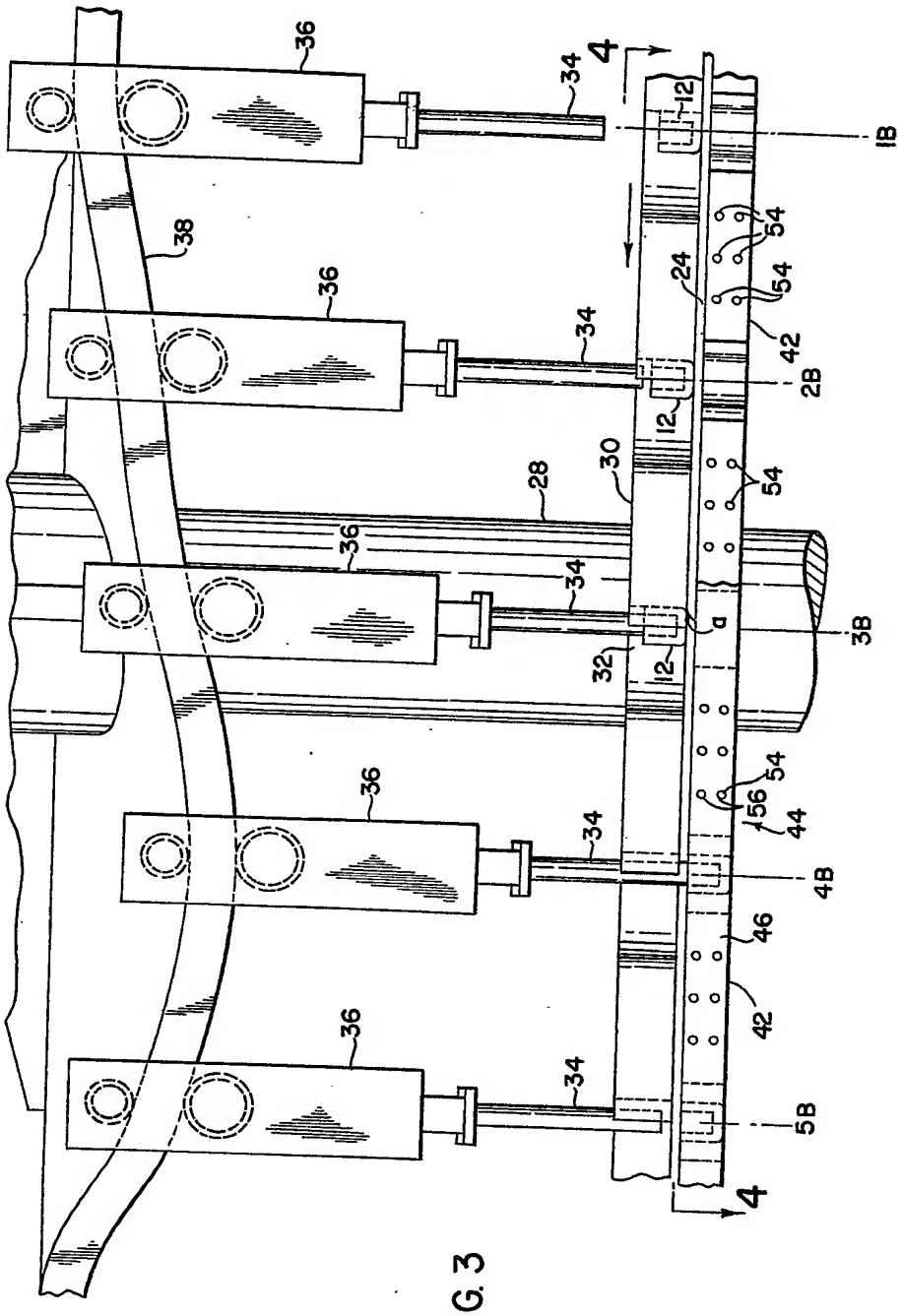

FIG. 3

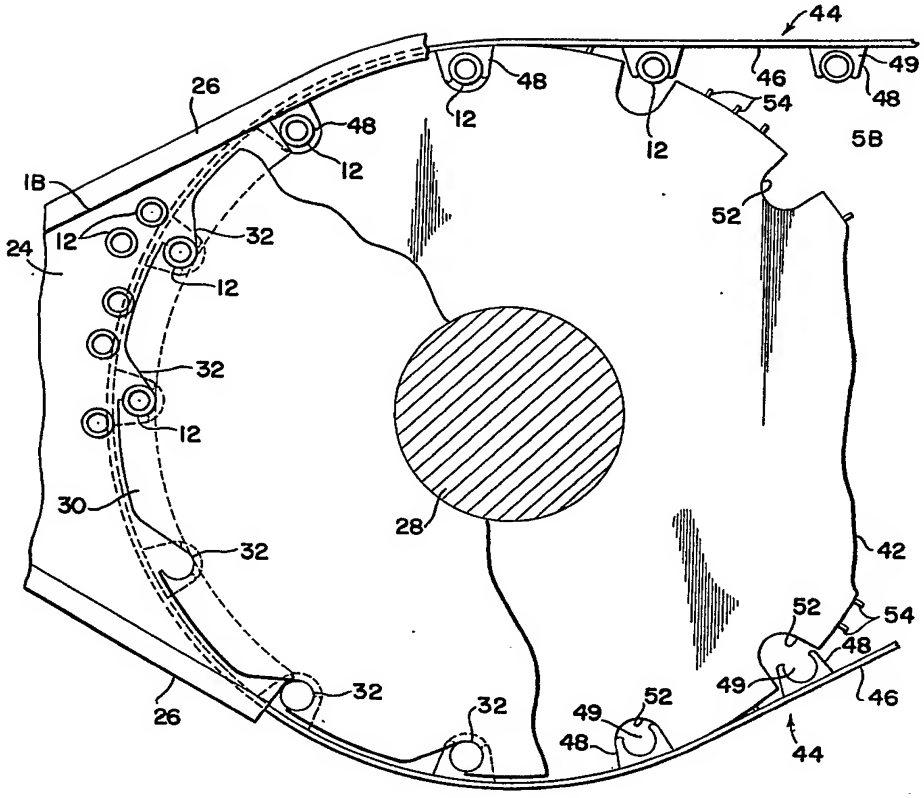
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FIG. 4

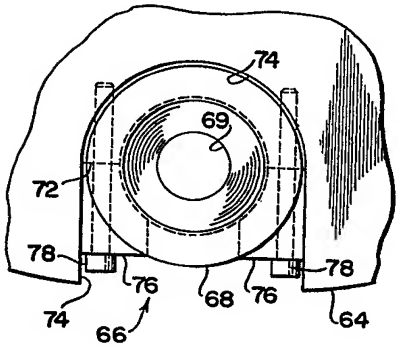
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FIG. 5A

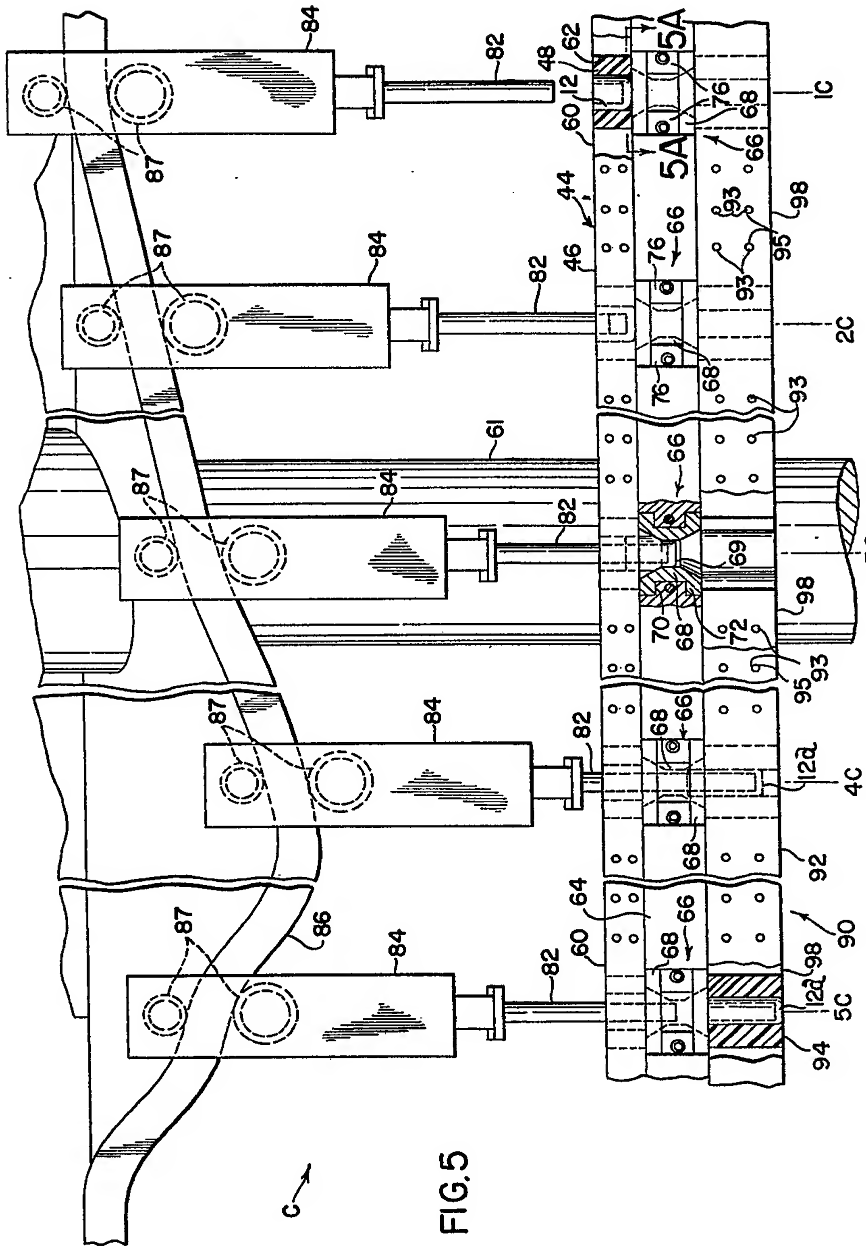
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FIG.5

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Sheet 6

FIG. 6

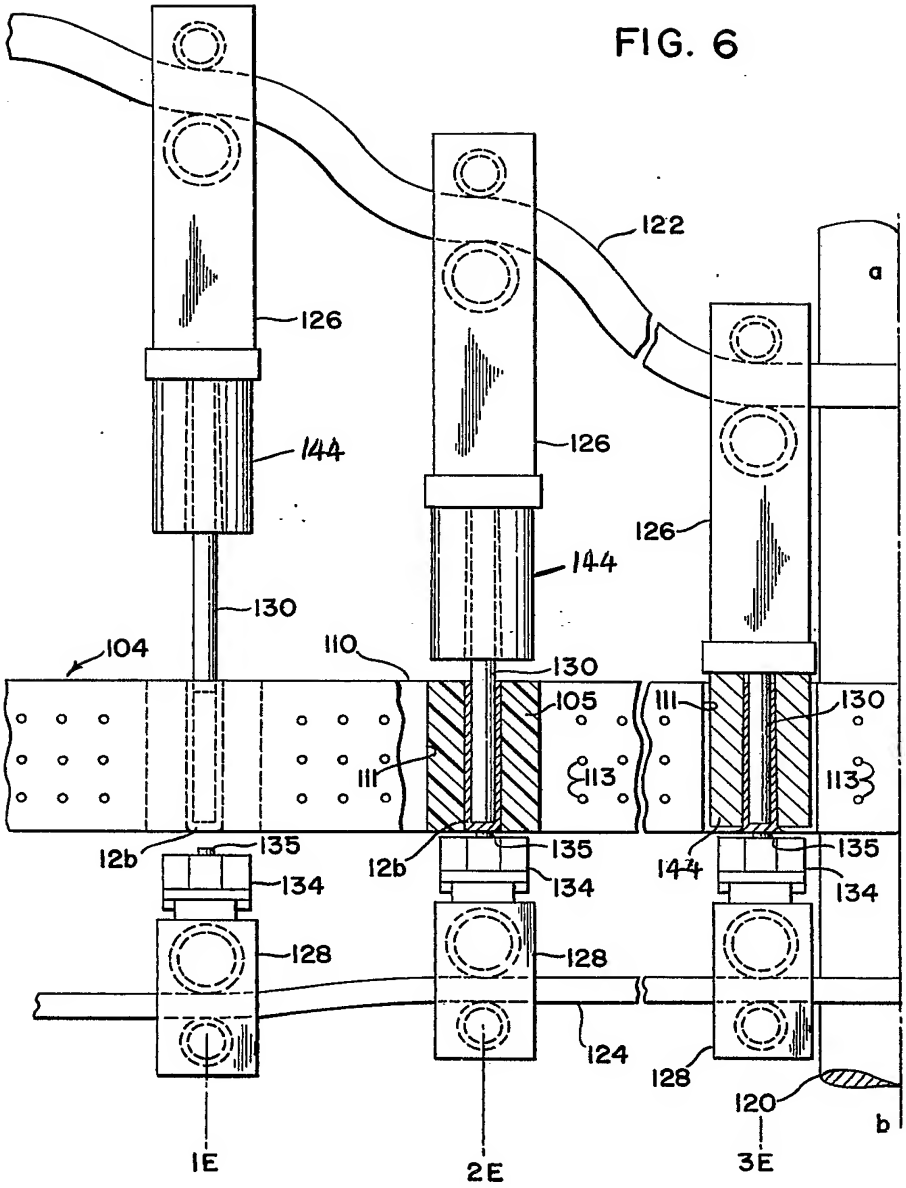
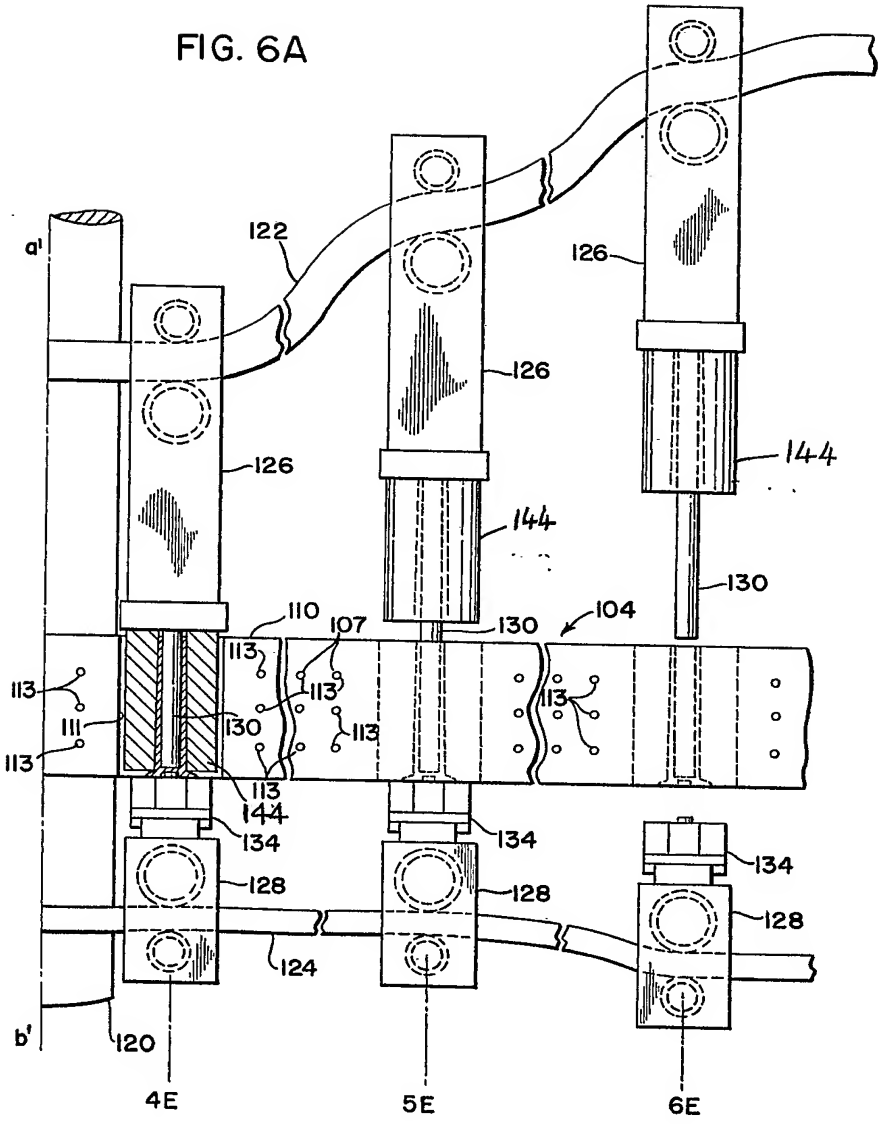


FIG. 6A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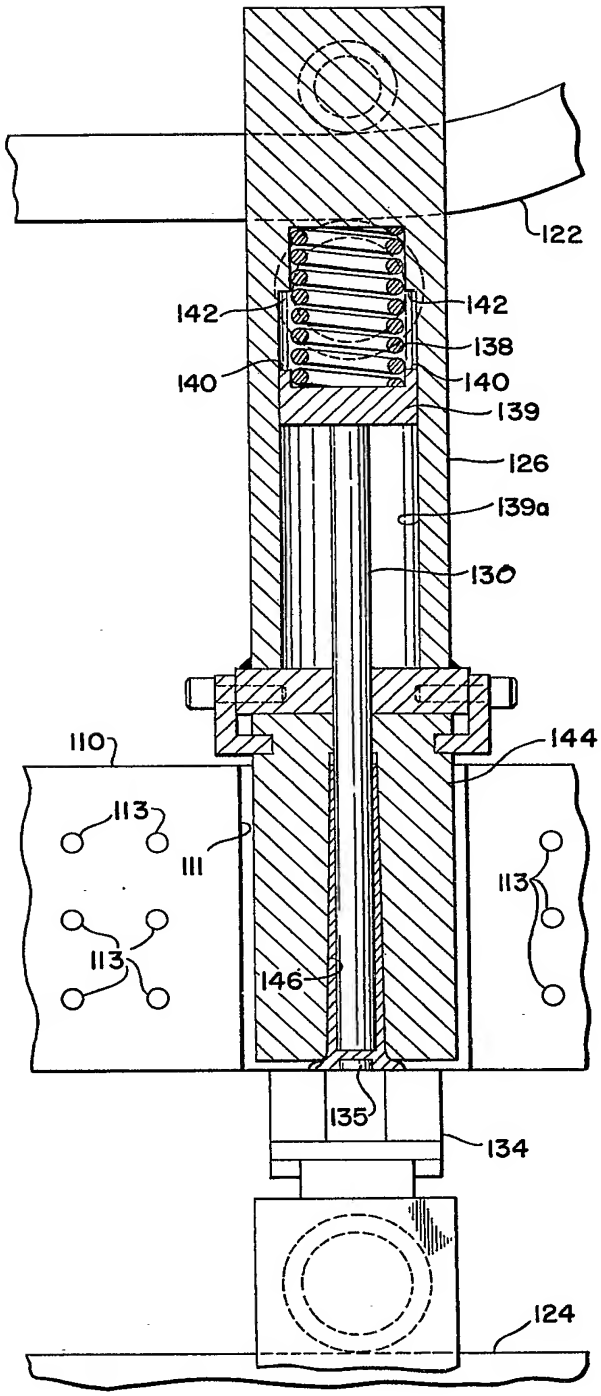
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FIG. 7